Just the Facts About ...

CSPS Update: 11/03

Stream Condition Trends Report

In 2001, DEP began its second five-year biological monitoring cycle to assess water quality conditions in all county watersheds. Previous monitoring sites are being revisited to measure and compare water quality conditions and changes over time. Our "yardstick" is the index of biological integrity or IBI. DEP has an IBI for fish and one for aquatic insects. The 2003 Update to the *Countywide Stream Protection Strategy* (CSPS) examines trends by comparing stations that were monitored for fish and/or aquatic insects in 1994-1998 with those monitored in 1999-2001. Monitoring stations with two data sets available to enable this analysis included 143 stations for aquatic insects (Figure 1) and 139 stations for fish (Figure 2). The two time periods isolate 1999's severe drought.

Stations are located throughout the upper county, including developed areas in Gaithersburg, Germantown, and Olney, and more rural areas in the northern and western portions of the county. A sufficient number of stations were revisited in the northern and western part of the county to estimate general trends for unmonitored streams within those watersheds. Trends could not be assessed in the southern part of the county, as monitoring stations in most of these watersheds were not sampled twice before the end of 2001.

Fifty-five percent of the stations evaluated had unchanged stream condition ratings for aquatic insect communities and for fish communities (Table 1). Of those remaining, increased IBI ratings were found in only 11 percent of the stations for aquatic insects and nine percent for fish. IBI scores decreased at least one or more rating for approximately one-third of the stations (34 percent for aquatic insects and 36 percent for fish). Stations that increased or decreased over this time period were located throughout the study area and had no obvious relationship to watershed land use or to stream size (Figures 1 and 2).

Natural variation and disturbances, such as floods and drought, can drastically alter the hydrology of a stream and reduce habitat available to fish and aquatic insects (Poff, 1995). Throughout Maryland, 1999 stream flows fell into the drought range, following below-normal precipitation of 1.0 to 3.5 inches each month in the severe drought from May through July (Figure 3; James, et al, 2000). Groundwater levels available to help replenish stream base flows also fell to extremely low

Impacts of drought and other natural processes. Image on left shows Northwest Branch Gage during the 2002 drought. Image on right shows normal baseline flow at the same station in 2003. Similar conditions existed during the 1999 drought.

Biological Community	Stream miles that increased in one or more stream condition ratings.		Stream miles that had unchanged stream condition ratings.		Stream miles that decreased in one or more stream condition ratings.	
	miles	% miles	miles	% miles	miles	% miles
Aquatic Insects	47	11	232	55	142	34
Fish	40	9	255	55	165	36

Table 1. Changes in stream conditions

levels. The United States Geological Survey reported that the number of monthly record lows in groundwater levels exceeded those of the very severe1960's drought. Even some of the highest quality streams experienced 1999 drought impacts. For example, almost no Upper Patuxent River stations could be sampled in the summer due to extremely low stream flows which segmented headwater streams into isolated pools with little or no surface flow between them.

Habitat Trends

One hundred eighty-four stations had two or more habitat ratings (1994-1998 and 1999-2001) that could be used for trend analysis (Figure 4). The majority of the stations, 116 (63 percent), showed very little change in habitat ratings from previous years. Only 19 stations (ten percent) showed an increase of one or more ratings for habitat, and six stations (three percent) showed the greatest habitat ratings decrease. Stream habitat condition was relatively constant during this period. For the major CSPS watersheds, the areas that improved and declined the most are shown in Table 2.

Observed habitat quality improvements or declines were generally related to change in the following habitat parameters: bank stability, embeddedness, sediment, and instream fish habitat.

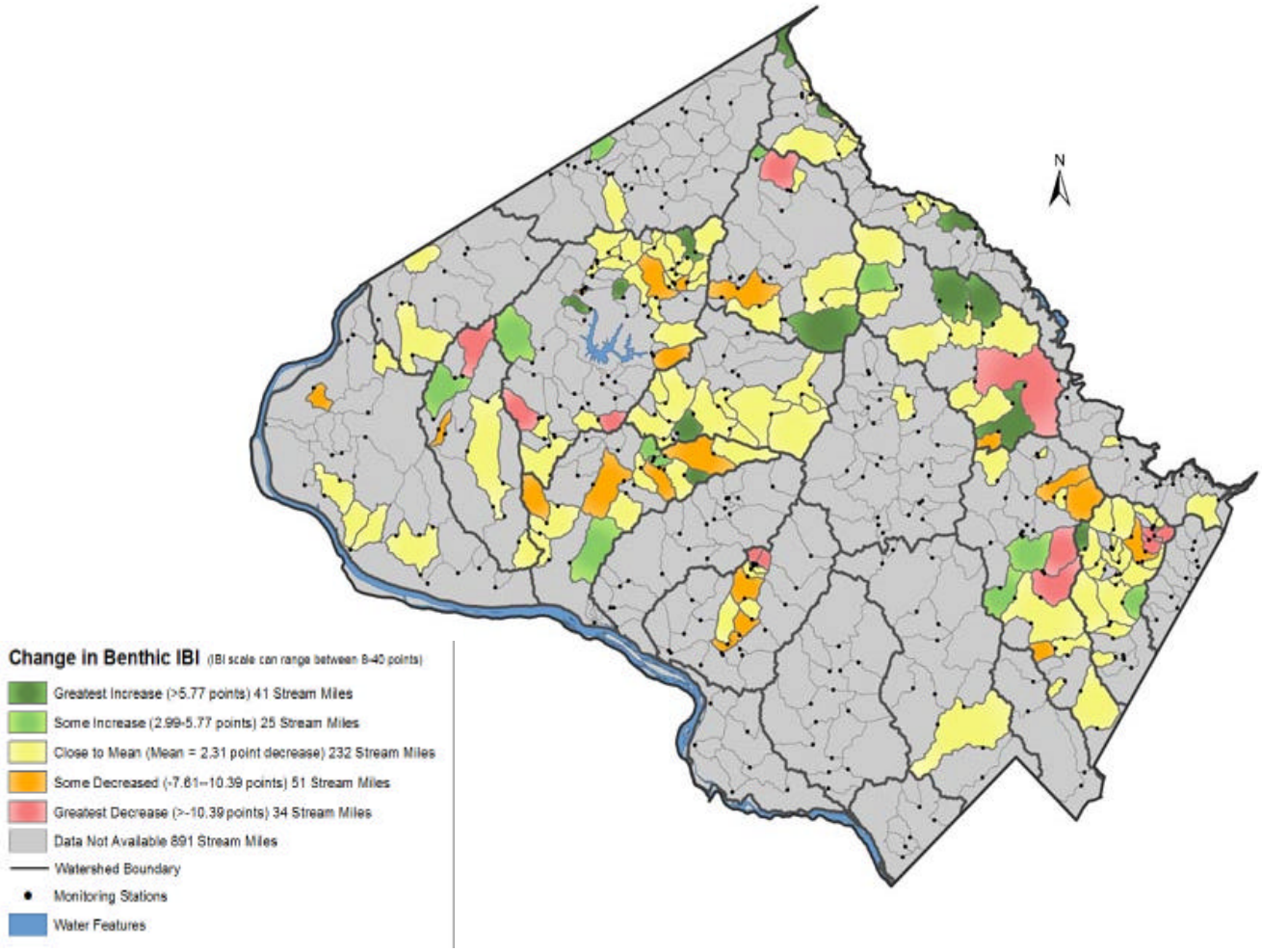

Figure 1. Trends among streams monitored twice using the IBI for aquatic insects. Changes in the benthic community in the county 1994 to 1998 vs. 1999 to 2001.

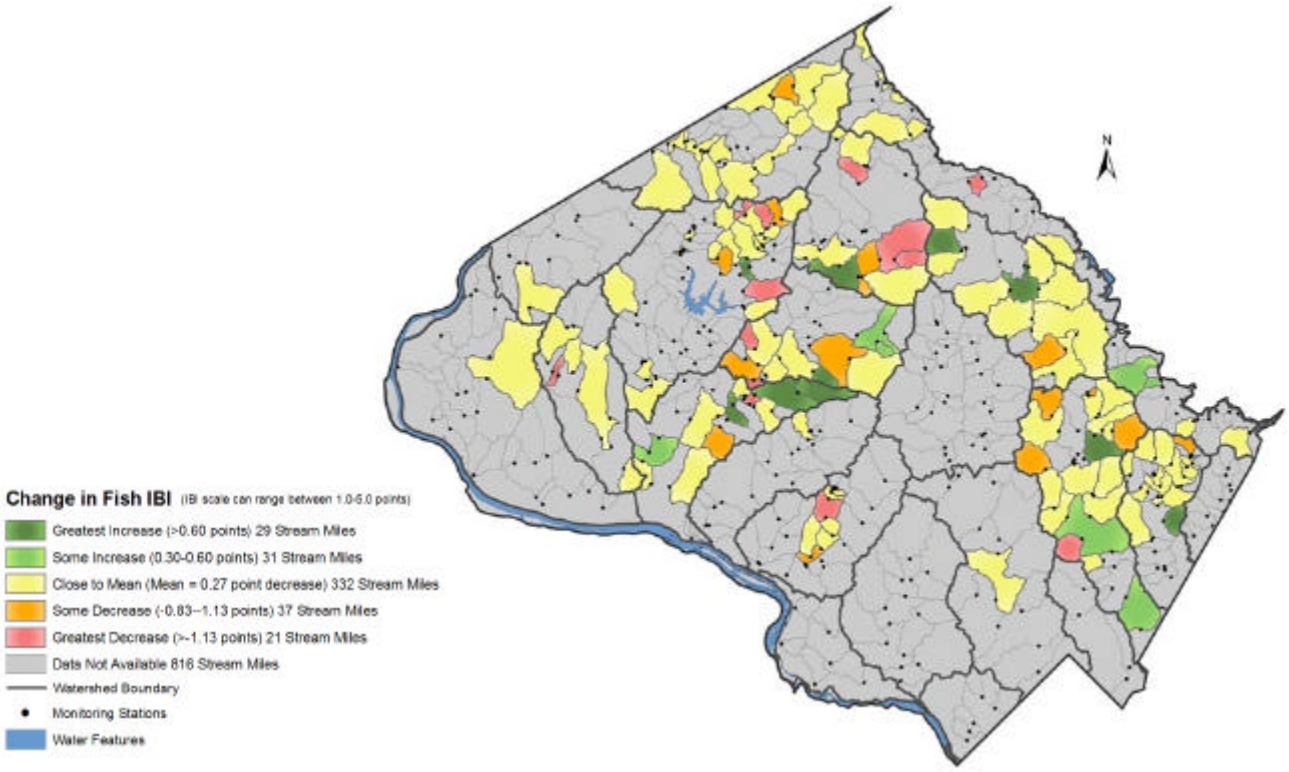

Figure 2. Trends among streams monitored twice using the IBI for fish. Changes in the fish community in the county 1994 to 1998 vs. 1999 to 2001.

Habitat Relationships to Biological Trends

Generally, there was little change in monitored habitat conditions that could be related to trends in IBI scores for fish or aquatic insects. However, analysis was limited to comparing data from only two points in time, and clear trends were not as readily evident. Nor was there any discernable pattern evident as to whether change was confined within a certain land use or stream size. Many of the observed decreases in the fish and aquatic insect community IBI scores are best attributed to the 1999 drought.

The majority of monitoring stations with the greatest increase in IBI scores for both aquatic insects and fish occurred in watersheds with little or no major land disturbances in upstream areas during this time period. Stations with the greatest decrease in IBI scores had experienced land disturbance in their drainage areas that may have affected the stream's quality. For example, water quality changes potentially caused by temporary construction impacts or long term land-use changes, would be cumulative to drought-related impacts, such as altered base and storm flows, increased sedimentation, loss of tree canopy coverage, water temperature increases, and increased nutrient concentrations. Future analysis, incorporating additional years of monitoring data, is necessary to

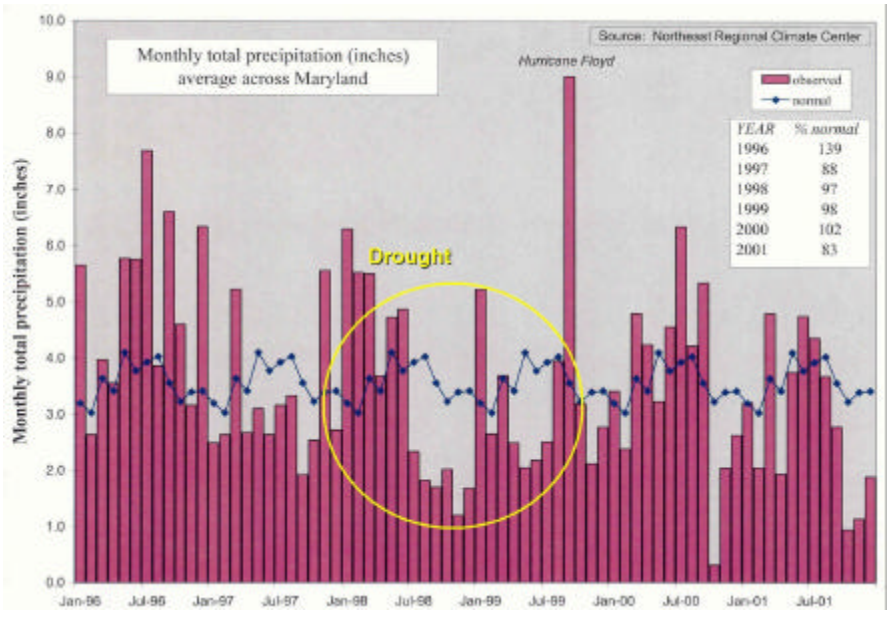

Figure 3. Monthly total precipitation

Habitat Rating Improvements	
Watershed	**Number of Stations**
Fahrney Branch	1
Hawlings River	3
Horsepen Branch	1
Lower Great Seneca Creek	2
Litle Seneca Creek	1
Northwest Branch	5
Paint Branch	2
Potomac Direct Tributary	1
Upper Great Seneca Creek	1
Upper Patuxent River	2
9 Watersheds Total	**19 Stations**

Habitat Rating Declines	
Watershed	**Number of Stations**
Little Bennet Creek	1
Lower Patuxent River	1
Paint Branch	3
Upper Great Seneca Creek	1
4 Watersheds Total	**6 Stations**

Table 2. Watershed habitat trends.

account for and isolate observed changes in biological communities. These changes may then be related to watershed development impacts from changes primarily reflective of natural variations in rainfall, runoff, and groundwater replenishment levels.

Notes:

g This symbol refers to technical terms which have been individually defined in the glossary of Montgomery County's Countywide Stream Protection Strategy Update (October 2003). The entire update is available for review and downloading at the Department of Environmental Protection's website: askdep.com

Updates: The CSPS is fully updated once every five years consistent with completion of DEP's monitoring of all county watersheds on a cycle of at least once every five years. As data becomes available and time permits, periodic updates are prepared within the five-year cycle.

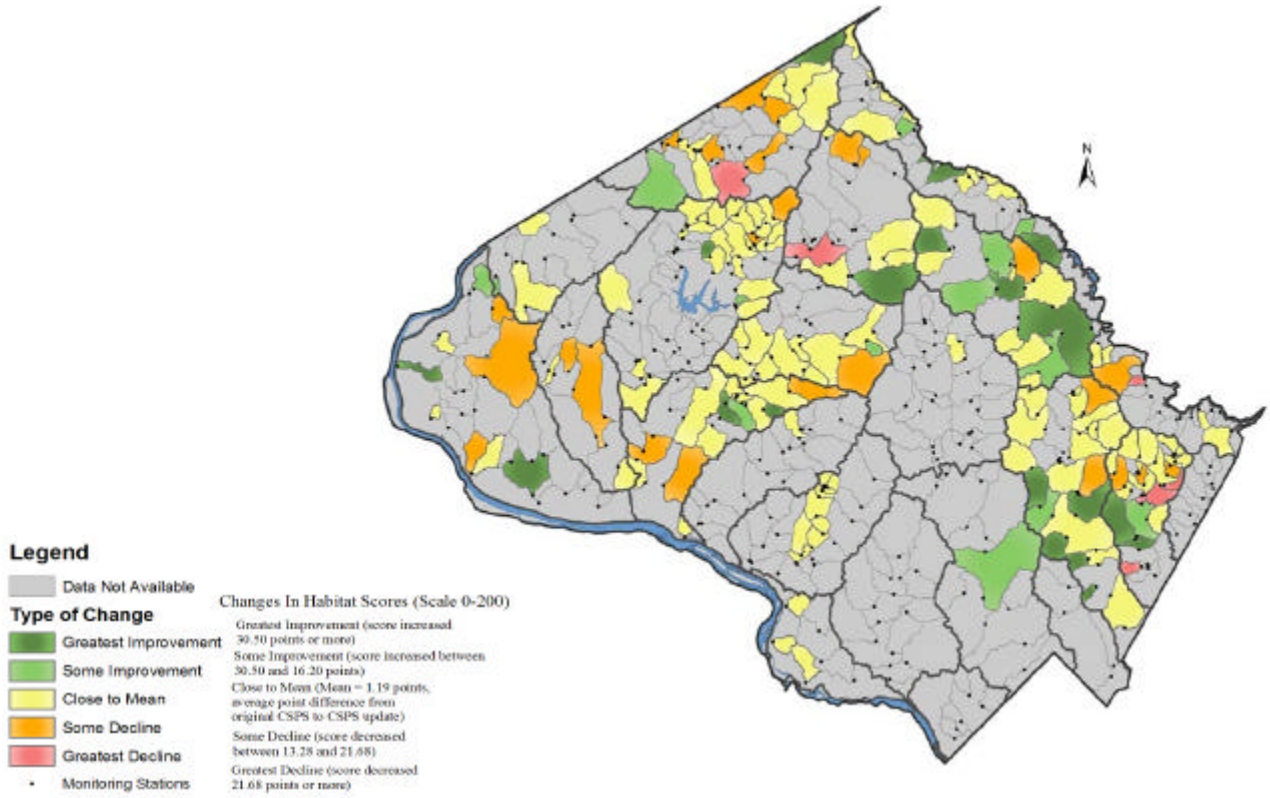

Figure 4. Habitat score comparison map. Changes in habitat quality from original 1997 CSPS to 2003 CSPS Update:

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